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MEMO

From: Daniel Ellsberg
To: Albert Wohlstetter, Frank Eldridge

Subj: Strains on the Fail-Safe System?

~~Extra~~ Copies to: Harry Rowen, Alain Enthoven, Ed Oliver, Jay Wakeley, Dick Mills,
R.B. Murrow, ~~and~~ C.J. Hitch, Bill Jones.

A) If "an order is an order," and we can predict ~~confidently that~~ with 100% confidence that "if Lemay said it, they'll do it," then we need have no worries about the fail-safe system; the positive control instructions are perfectly explicit that, "'no order to go ahead' means, 'you are ordered to come back.'"

But if we imagine that virtually any order might be disobeyed under certain circumstances, we might be curious--with an order as important as this one--as to what those circumstances might look like (and how likely they seem to be).

~~Of course,~~ (disobedience might arise from laziness, cowardice, or personal goals; I will ignore these possibilities. Among elite troops (like SAC pilots) a more significant pressure to "disobey" might arise when it appeared necessary to break the letter of one order ~~in~~ to carry out the "real" wishes of their superiors. (to the SAC pilot

If "no go-ahead command" were a totally unambiguous signal of ~~this~~ the desires of his ~~superior~~ superior officers (i.e., "come back"), this sort of pressure to disobey his positive control orders would not even arise. But when there is "noise" in the communication system, there is a possibility that this "signal" (i.e., lack of go-ahead command) might not reflect the current wishes of his commanders; they might have ordered him to go ahead, but their signal failed to get through.

Thus, a possible consequence of his obeying the order would be, "Coming back when they really wanted me to go ahead." A good pilot is inevitably going to regard this as a costly error (even if he does regard the alternate ~~more~~ possible going ahead when they wanted him to come back--as just as costly, or as very much more costly). But so long as he regards it as having low probability, the thought will not put a heavy strain on his willingness to obey his positive control instructions.

He will regard it as having low probability, for example, if he estimates that: a) the chance that they sent a go-ahead order (i.e., the chance that this is not another false alarm) is low; and b) the conditional probability that, if the order were sent, it would not get through to him, is low. (The latter seems likely to be low--though not 0--if only a "natural" breakdown of communications is considered.)

But what if he regards this conflict between the letter of his positive control orders and the actual current desires of his superiors as having a fairly high probability, at the moment he makes his decision? It seems to me that this might put a strain on the literal obedience of every pilot in the air; and if there were 200-400 pilots in the air, it is not hard to imagine that at least one or more would resolve the strain by going ahead. At the very least, some of them would come closer to it than they would in the earlier situation: which in itself is a possibility worthy of some attention.

Now, why would he ever put a fairly high probability on the possibility that a go-ahead signal had been sent and had ~~like~~ failed to get through? It strikes me that two conditions might contribute to that estimate:

1) He had been allowed to get up to the positive control line without being called back. I have a hunch this is not typical training procedure, and that if there have been any real false alarms, they have not persisted this long. (Bill Jones, Dick Mills, and Jay Wakeley have the impression that this is correct). If so, then as soon as he gets much beyond the furthest point that he ever attained in a previous training alert of false alarm, ~~the subjective~~ his subjective probability that this is the "real thing," begins to go way up; it might or might not become "more likely than not." Say it hits 30%.

2) Suppose that the information in Eldridge's S-99 has somehow trickled through to him. Then the conditional probability that communications might break down given an SU attack could look like 100%, or close to it.

Under these two conditions (a prior training policy that made this flight--which, we assume, is in fact a ~~far~~ false alarm--~~look~~ seem "likely" to be the real thing; and pilot knowledge of S-99), the probability that the ~~right~~ go-ahead order had really been sent (or should have been sent) but had not been received could appear almost as high as the probability that there was really a war on: at that moment. almost 30%. It could be higher; but a lot of pilots

~~and~~ would be feeling the strain even at that level.

He would have received a briefing on his positive control orders. Did the intensity of that briefing really reflect the fact that he might be under this level of pressure? Can any briefing, by itself, really ensure compliance under these conditions?

This isn't the whole story. Suppose that he does consider going ahead; presumably he will try to check the situation first. His orders in SACM 55-8 allow him—if he doesn't get a go-ahead signal, to ~~the~~ check by UHF with the UHF ground station nearest to the positive control line. But those orders indicate that not all planes in the strike will be near enough to a UHF station (they mention that such planes must rely on the HF message from headquarters, coming back if they don't get a go-ahead). Such planes would probably try to communicate ~~by HF~~ by HF (even though they are supposed to keep HF silence). Now the question becomes interesting: out of 400 planes in the air, what are the chances that one or more would be out of communication at this moment ~~not~~ for "natural" causes? (Some planes would have to be out on both UHF and HF; some would merely have to be out on HF, not being close enough to a UHF ground station).

Frank Eldridge and Bill Jones estimate this chance at definitely greater than 0; ~~these~~ in fact, the expected number of planes that might try and fail to raise headquarters at this point looks greater than 1. These are the interesting cases.

~~If~~ I haven't any detailed fixes to offer, if this is a problem, but three suggestions might at least indicate ~~further~~ the nature of the situation:

- a) It might be useful (though ~~extensive~~ and possibly dangerous) to run fully realistic combat alerts which allow the planes to go up to the positive control line, ~~and~~ so that if a false alarm ever lets them get that far they won't assume that a war is almost certainly on. Of course, such an unannounced alert would have to take special precautions (e.g., planes monitoring the positive control points, backup radio facilities) to make sure that the behavior suggested above didn't occur the very first time.
- b) Pilots might be "protected" from the information in S-99; or,
- c) Briefings on the positive control orders might be repeated, much more emphatically, frankly predicting the sort of pressures described above and reiterating, "We know what you'll be thinking, but come back anyway."

(Incidentally, I suspect that (c) without (a) would not be effective enough.)

B₂) Suppose that one pilot (say, one crew), decides that while it isn't certain that the war is on, the chances are good enough to justify going ahead. (He has tried to reach headquarters on HF but failed; he isn't near a UHF ground station). Or—to introduce a new possibility—suppose that he is one of Ikle's madmen. Now, suppose that he would like to take few buddies with him: by sending them an apparently authentic "go-ahead" signal.

Whether or not these conditions seem likely, I find it interesting that it appears he would be able to do this.

According to SACM ~~55-8~~ 55-8, the alert pilot has in his plane (or on his person) an envelope which has a group of code numbers on the outside and another group on the inside. An authentic go-ahead signal consists of a message giving two groups of numbers, the first corresponding to the group on the outside, the second corresponding to the group on the inside. (After receiving a ~~signal~~ signal giving the ~~message~~ numbers on the outside of his envelope, the pilot opens the envelope and checks the numbers on the inside; if they also match, he has received an authenticated signal).

Question: Are these two groups of numbers the same for all alert planes in the air? Jones, Mills, Eldridge and Wakeley think that the answer is "Yes." Then, any pilot can open his envelope and learn the entire authenticated message.

He could broadcast this over HF, and the whole alert force would assume itself to be hearing the go-ahead signal. This was my first fantasy; the trouble with it is that headquarters would be monitoring HF, and they would know that someone was playing a joke. Much cleverer for him, then, to wait till he reached the positive control line and then broadcast over UHF to planes within hearing (his cell, say): "I just received a very faint signal, interrupted several times, over HF; here it is."

Note: according to Mills, alert planes are ordered to relay such orders ~~by~~ by UHF to each other. And, although they might check ~~x~~ the failure to receive a go-ahead signal with a ground station, it isn't obvious that they would check up on ~~x~~ what appeared to be a perfectly clear directive.

(This in itself suggests the possibility that one plane might get the order on HF when others failed to do so.) our

This "problem" may be based only upon lack of information. If the possibility does exist, it still seems to many people to be too bizarre to worry about. But if we are worried at all about the madman case (and if we might worry about the behavior I discussed earlier, which would not require a madman at all), we should be worried about the ability of a madman to carry a cell with him.

Possible fixes: new procedures for checking instructions; back-up communications ~~thisxxx~~ (these possibilities merely make this more urgent); a "combination lock" for weapons; separate authentication for different planes (this may be infeasible because of time constraints; on the other hand, can't there be parallel transmission on ~~in~~ different frequencies?).

C) ~~Suppose that the plan for putting radio transmitters in 500 ICBMs goes through.~~ Suppose that, as the alert planes are approaching the positive control line, a US ICBM goes over their heads ~~toward~~ towards Russia, either because: a) "premature discharge," all of the ICBMs having suddenly gone on combat alert, or ~~(if this is impossible)~~ (b) a "madman," ~~who~~ ^(think of Eldridge,) has chosen this plausible moment.

Suppose that this ICBM is one of the 500 or so that ^(have) had radio transmitters installed. If those transmitters have some canned messages in them, then the airborne pilots might hear this one chanting, "Follow me," on UHF. If they don't have canned messages in them, the madman might have put this one in. If neither of these occur, it still seems possible (to me, in my ignorance) that this transmitter might be emitting some sort of signal, which might have the minimum significance to the listening pilots ~~that is to say the other ICBMs~~: "I am going." Add this to the worries mentioned under (A), and you might ~~get~~ ^(have) a siren song.

(Note: if there were ~~more~~ an "accidental discharge"—or if there were more than one—in the course of ~~x~~ what seemed to be a false alarm, SAC headquarters no doubt would be doing a good deal of soulsearching as to whether this didn't "compel" them to go ahead. Some pilots might even ~~reason~~ reason this out for themselves; but I doubt whether they should be encouraged to do so. And the notion might even tempt ~~SAC~~ a few SAC planners that a pilot who heard ICBMs talking overhead should follow them unless he received an order to return. Perhaps we should be prepared to deal with this argument.)